



(11)

EP 4 230 910 A1

(12)

EUROPEAN PATENT APPLICATION
published in accordance with Art. 153(4) EPC

(43) Date of publication:

23.08.2023 Bulletin 2023/34

(21) Application number: **22877664.7**

(22) Date of filing: **11.11.2022**

(51) International Patent Classification (IPC):

F23G 1/00 (2006.01) **F23G 7/00** (2006.01)
B09B 3/00 (2022.01) **B01J 19/00** (2006.01)
B01J 19/08 (2006.01) **B62D 39/00** (2006.01)

(86) International application number:

PCT/IB2022/060872

(87) International publication number:

WO 2023/126705 (06.07.2023 Gazette 2023/27)

(84) Designated Contracting States:

**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL
NO PL PT RO RS SE SI SK SM TR**

Designated Extension States:

BA

Designated Validation States:

KH MA MD TN

(30) Priority: **30.12.2021 RU 2021140063**

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(54) **MOBILE CREMATORIUM**

(57) The invention relates to devices intended for cremation of dead bodies of humans or animals, in particular, for cremation by plasma-chemical destruction method. The invention is directed to attaining a technical effect of broadening range of technical solutions by providing a movable crematory that assures plasma-chemical destruction of dead bodies of humans or animals. This technical effect is attained by a movable crematory that includes a chassis bearing a reactor implemented in form of a closed cavity with an opening configured to provide placing dead bodies of humans or animals to be cremated in the reactor, and to close the reactor after that, and also with an opening for outputting gaseous products. The crematory additionally includes a source of high-voltage pulses, that is connected to an electrode protruding into the reactor via an isolating member, wherein inner surfaces of the reactor cavity are made conductive entirely or partially and a gap is provided between the inner surfaces and the electrode, the gap assuring generation of corona discharge plasma in the reactor due to the high-voltage pulses.

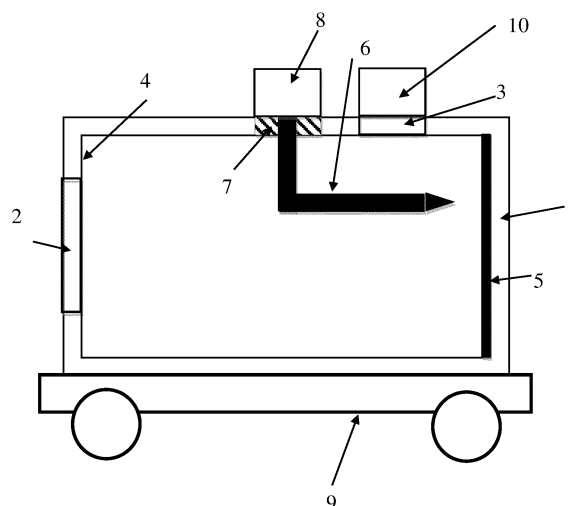


Fig.1

Description**Field of invention**

- 5 **[0001]** The invention relates to devices intended for cremation of dead bodies of humans or animals, in particular, for cremation by plasma-chemical destruction method.

Prior art

- 10 **[0002]** There is a known movable crematory of utility model patent RU122466 (published on November 27, 2012). The crematory consists of a shell disposed on a chassis, the shell including a burning chamber with a heat-resistant insert, a control unit configured to implement thermal and temporal pattern of burning chamber operations, and to control function of removal of combustion products, gas burners connected to a pipeline for feeding fuel mixture to the burner, and an exhaust pipe branch located on the butt end surface of the chamber and intended for removal of the combustion products.

15 **[0003]** A drawback of this device is necessity of using fuel for cremation and maintaining high temperature in the chamber to assure operations of the device, which may be not acceptable for movable mode of use.

[0004] As far as is known, cremation is burning of dead bodies in special furnaces. According to information of Physical Encyclopedia (Soviet Encyclopedia, Moscow, 1984):

- 20 "Burning is a complex chemical reaction that takes place under conditions of progressive self-acceleration related to accumulation of heat or catalyzing products of reaction in the system.

[0005] During burning, high temperature (up to several thousands of Kelvins) may be reached, and a light emitting area as known as flame often occurs. For instance, burning includes different exothermic reactions of high-temperature oxidation of fuel, decomposition of explosives, ozone, acetylene, additive reactions between some substances and chlorine, fluorine, etc. In most cases, burning consists of a number of elementary chemical processes and closely relates to heat transfer and mass transfer phenomena. Distinctive feature of burning is conducting chemical reaction under conditions of its self-acceleration. There are two self-acceleration mechanisms, thermal mechanism and chain mechanism. For thermal-type of burning, rate of chemical reaction increases sharply with rise of temperature, and heat generated during the reaction causes its further acceleration. For chain-type of burning, self-acceleration occurs owing to avalanche-like rise of concentration of active particles (atoms or radicals) during a branching chain reaction, which boosts chemical transformations".

- 30 **[0006]** According to document [1], plasma of discharge having atmospheric pressure exerts an effect on water, thus causing formation of free radicals due to disintegration of water molecules $\text{H}_2\text{O} \rightarrow \text{OH}\cdot + \text{H}\cdot$. The formed active radicals $\text{OH}\cdot$ initiate chain reaction of oxidation of organic substances, which occurs in presence of water, according to document [2]. In other words, this process may be attributed to burning processes and may be used for cremation.

Summary of invention

- 40 **[0007]** The invention is directed to attaining a technical effect of broadening range of technical solutions by providing a movable crematory that assures plasma-chemical destruction of dead bodies of humans or animals.

- [0008]** This technical effect is attained by a movable crematory that includes a chassis bearing a reactor implemented in form of a closed cavity with an opening configured to provide placing dead bodies of humans or animals to be cremated in the reactor, and to close the reactor after that, and also with an opening for outputting gaseous products, wherein the crematory includes a source of high-voltage pulses, that is connected to an electrode protruding into the reactor cavity via an isolating member, and wherein inner surfaces of the reactor cavity are made conductive entirely or partially and a gap is provided between the inner surfaces and the electrode, the gap assuring generation of corona discharge plasma in the reactor due to the high-voltage pulses.

[0009] Preferably, minimum size of the gap between the electrode and conductive portions of the cavity inner surfaces is 5 to 50 millimeters.

- 50 **[0010]** Preferably, the conductive portions of the cavity inner surfaces are made of steel and grounded.

[0011] Preferably, the electrode is made of steel.

[0012] Preferably, pressure inside the reactor is decreased by 0.1 to 1.0 Pa compared to atmospheric pressure.

[0013] In one embodiment, decrease in pressure inside the reactor is provided by electrostatic filter having an extraction air fan, which filter is connected to the opening for outputting gaseous products.

- 55 **[0014]** Preferably, input of outside air to the reactor is restricted.

Brief description of drawings

[0015] The invention is illustrated by the figure.

[0016] Fig. 1 shows a vertical cross-section of the reactor where the following designators are used:

- 5 1 reactor with inner cavity;
- 2 input opening;
- 3 output opening;
- 4 inner surface of reactor cavity;
- 10 5 conductive portions of inner surface of reactor cavity;
- 6 electrode;
- 7 isolating member;
- 8 source of high-voltage pulses;
- 9 chassis;
- 15 10 electrostatic filter with extraction air fan.

Detailed description of embodiments

[0017] The invention may be implemented as a movable crematory that includes a chassis (9) bearing a reactor (1) with an input opening (2) configured to close the reactor after a dead body to be cremated is placed inside, and with an output opening (3) connected to an electrostatic filter (10) equipped with an extraction air fan, wherein a portion (5) of the inner surface (4) of the reactor cavity is made of steel, an electrode (6) protrudes into the reactor cavity via an isolating member (7), and the electrode (6) is connected a source (8) of high-voltage pulses, while the electrode (6) is spaced from the portion (5) of the inner surface (4) of the reactor cavity by a gap of 20 millimeters.

[0018] The movable crematory operates as follows.

[0019] The movable crematory installed on the chassis (9) is transported to a place of conducting cremation. The portion (5) of the inner surface (4) of the cavity of the reactor (1) is grounded. Dead bodies of humans or animals to be cremated are placed in the crematory via the input opening (2) and then the input opening (2) is closed. High-voltage pulses are supplied to the electrode (6) from the source (8). As it is known from document [1], large number of streamers occur between the electrode (6) and the grounded conductive portion (5) of the inner surface (4) of the reactor cavity with each pulse. The streamers start multiplying and spreading towards the portion (5), gradually populating the inter-electrode gap and forming corona discharge. Plasma of corona discharge exerts an effect on water contained in the dead bodies to be cremated and causes formation of free radicals upon destruction of water molecules: $\text{H}_2\text{O} \rightarrow \text{OH}\cdot + \text{H}\cdot$. In addition, other active substances are formed in the reactor under action of corona discharge: O_3 , $\text{O}_2(\text{a}^1\Delta)$, H_2O_2 , OH , O^3P , NO , HNO_2 and HNO_3 . Corona discharge also causes ultraviolet (UV) radiation. The above-mentioned active substances and UV radiation destroy any organic and inorganic substances contained in the dead bodies to be cremated, thus providing complete destruction thereof and formation of harmless gaseous reaction products, namely, water and carbon dioxide. Non-organic contents of the dead bodies to be cremated are destroyed by acids. Process of oxidation of organic substances is a chain reaction [2]. The destruction chain reaction is initiated by $\text{OH}\cdot$ radicals. In other words, plasma-chemical destruction of both organic and inorganic substances contained in the dead bodies to be cremated is provided in the device. Gaseous products of destruction enter the output opening.

[0020] Thus, the specified technical effect is attained in the device by providing a movable crematory that ensures plasma-chemical destruction of dead bodies of humans or animals.

Non-patent Literature

[0021]

- [1] Аристова Н.А., Пискарев И.М., Ивановский А.В., Селемир В.Д., Спиров Г.М., Шлепкин С.И. Инициирование химических реакций под действием электрического разряда в системе твердый диэлектрик-газ-жидкость // Журнал физической химии. 2004. Т. 78. № 7. С. 1326-1331. (Aristova N.A., Piskarev I.M., Ivanovskiy A.V., Selemir V.D., Spirov G.M., Shlepkin S.I. Initiation of chemical reactions by electrical discharge in dielectric-gas-liquid configuration // Physical Chemistry Journal, 2004, Vol. 78, #7, pages 1326-1331.)

[2] Пискарев И.М. Окислительно-восстановительные процессы в воде,

инициированные электрическим разрядом над ее поверхностью // Журнал общей химии. 2001. Т. 71. Вып. 10. С. 1622. (Piskarev I.M. Oxidation-reduction processes in water initiated by electrical discharge above water surface // General Chemistry Journal, 2001, Vol. 71, Issue 10, page 1622.)

Claims

1. A movable crematory including a chassis that bears a reactor implemented in form of a closed cavity with an opening, the opening configured to provide placing dead bodies of humans or animals to be cremated in the reactor, and to close the reactor after that, and also with an opening for outputting gaseous products, **characterized in that** the crematory includes a source of high-voltage pulses connected to an electrode protruding into the reactor cavity via an isolating member, wherein inner surfaces of the reactor cavity are made conductive entirely or partially and a gap is provided between the inner surfaces and the electrode, the gap assuring generation of corona discharge plasma in the reactor due to the high-voltage pulses.
2. The movable crematory of claim 1, wherein minimum size of the gap between the electrode and conductive portions of the inner surfaces of the reactor cavity is 5 to 50 millimeters.
3. The movable crematory of claim 1, wherein the electrode is made of steel.
4. The movable crematory of claim 1, wherein conductive portions of the inner surfaces of the reactor cavity are made of steel and grounded.
5. The movable crematory of claim 1, wherein pressure inside the reactor is decreased by 0.1 to 1.0 Pa compared to atmospheric pressure.
6. The movable crematory of claim 5, wherein the decrease in pressure inside the reactor is provided by connection of an electrostatic filter to the output opening, and the electrostatic filter has an extraction air fan.
7. The movable crematory of any one of claims 1-6, wherein input of outside air to the reactor is restricted.

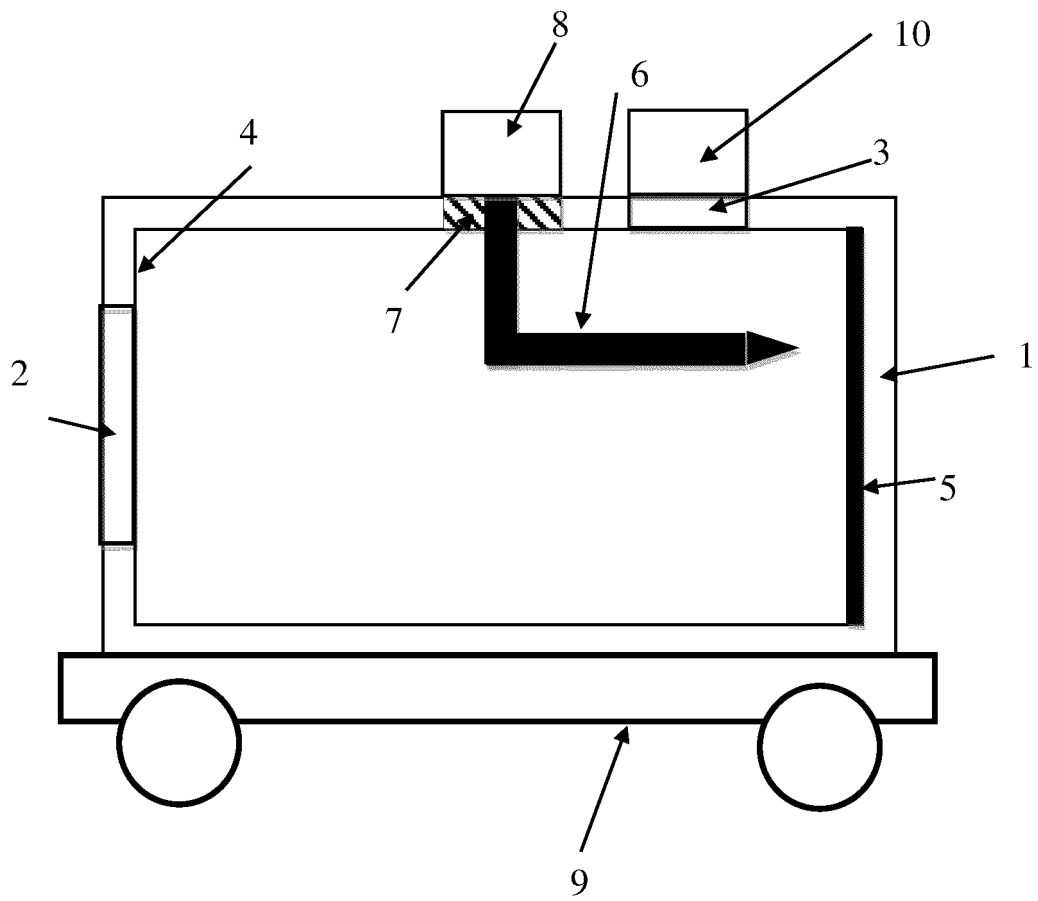


Fig.1

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB 2022/060872

A. CLASSIFICATION OF SUBJECT MATTER

F23G 1/00 (2006.01) B62D 39/00 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F23G 1/00, 7/00, B09B 3/00, B01J 19/00, 19/08, B62D 39/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PatSearch (RUPTO internal), USPTO, PAJ, K-PION, Esp@cenet, Information Retrieval System of FIPS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	RU 122466 U1 (KIREEV BORIS VASIL'EVICH et al.) 27.11.2012, p. 2 lines 31-45	1-7
Y	US 2013/0318947 A1 (MUHAMMAD ARIF MALIK et al.) 05.12.2013, [0032]-[0036], [0038], [0068], [0094], fig. 1A, 1B	1-7
Y	CN 1316615 A (LI S. ET al.) 10.10.2001, description p. 1, fig. 1	1-7
Y	RU 2753275 C1 (CHZHAN TSZIN' et al.) 12.08.2021, [00107], fig 1A	4
A	WO 2012/044875 A1 (OLD DOMINION UNIVERSITY RESEARCH FOUNDATION) 05.04.2012	1-7
A	CN 103204467 A (UNIV BINZHOU) 17.07.2013	1-7

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

22 February 2023 (22.02.2023)

Date of mailing of the international search report

02 March 2023 (02.03.2023)

Name and mailing address of the ISA/RU

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- RU 122466 [0002]

Non-patent literature cited in the description

- *Physical Encyclopedia (Soviet Encyclopedia, Moscow, 1984* [0004]
- **ARISTOVA N.A. ; PISKAREV I.M. ; IVANOVSKIY A.V. ; SELEMIR V.D. ; SPIROV G.M. ; SHLEPKIN S.I.** Initiation of chemical reactions by electrical discharge in dielectric-gas-liquid configuration. *Physical Chemistry Journal*, 2004, vol. 78 (7), 1326-1331 [0021]
- **PISKAREV I.M.** Oxidation-reduction processes in water initiated by electrical discharge above water surface. *General Chemistry Journal*, 2001, vol. 71 (10), 1622 [0021]